

SOP-08

**Borehole and Monitoring
Well Destruction**

**Yerington Mine Site
Standard Operating Procedure**

Revision 0

Revision Date: June 6, 2006

SOP-08
BOREHOLE AND MONITORING WELL DESTRUCTION

TABLE OF CONTENTS

1.0	PURPOSE.....	1
2.0	APPLICABILITY	1
3.0	RESPONSIBILITIES	1
4.0	REQUIRED MATERIALS	1
5.0	PROCEDURE	2
5.1	Permitting.....	2
5.2	Site Preparation	2
5.3	Small Diameter, Shallow Soil Boring Abandonment.....	2
5.4	Large Diameter, Deeper Soil Boring Abandonment	2
5.5	Well Destruction	3
5.6	Documentation And Records	3
6.0	QUALITY ASSURANCE/QUALITY CONTROL	4
7.0	REFERENCES	4

1.0 PURPOSE

The purpose of this standard operating procedure (SOP) is to identify the methods to be used to “abandon” or “destroy” soil borings and monitoring wells. Abandonment or destruction as used in this SOP is defined as the permanent decommissioning, destruction, or backfill of a soil boring or monitoring well that is no longer useful.

2.0 APPLICABILITY

This procedure will be followed for all borehole and monitoring well abandonments unless otherwise required per local regulatory agencies overseeing the abandoned permitting process.

3.0 RESPONSIBILITIES

The *Project Manager*, or designee, will have the responsibility to oversee and ensure that borehole and well abandonment is conducted in accordance with this SOP and any site-specific work plans, scopes of work (SOW), quality assurance plan (QP), and site health and safety plan (SHSP).

The *field sampling personnel* will be responsible for the understanding and implementation of this SOP during all field activities, as well as, obtaining the appropriate permits, field logbooks, forms and records necessary to complete the field activities.

It will be the responsibility of the *drilling subcontractor* to provide the necessary equipment and materials for borehole and monitoring well abandonment. This generally includes appropriate backfill materials such as Portland cement, potable water, and bentonite powder and/or chips. Other equipment or materials may be required to meet project specifications.

4.0 REQUIRED MATERIALS

In addition to those materials provided by the subcontractor, the following materials are required:

- Water level indicator
- Personal protective equipment (PPE)
- Miscellaneous hand tools
- Tape measure
- Camera and film
- Health and Safety equipment
- Explosimeter, OVA (FID) or OVM and associated chargers
- Bound field logbook
- Field documentation records
- Waste containment labels

5.0 PROCEDURE

Well destruction procedures vary from state to state and even locality to locality. Permitting requirements also vary considerably. The procedures outlined in this SOP are considered technically valid, but always check with the local oversight agency regarding well destruction protocols before following this SOP to make sure these instructions are consistent with local requirements.

5.1 Permitting

A permit to abandon a monitoring well or backfill a soil boring may be required from the local regulatory agency. Prior to initiating any work with regards to well destruction evaluation of permit requirements will be conducted and permit applications submitted to the oversight regulatory agency.

5.2 Site Preparation

Prior to abandonment, each boring and/or monitoring well will be inspected for obstructions and other desirable materials that might interfere with abandonment. If necessary the well shall be cleaned so that undesirable materials are removed.

5.3 Small Diameter, Shallow Soil Boring Abandonment

Small diameter (less than 4-inch diameter) soil borings completed to a depth less than 20 feet, without encountering groundwater can be backfilled with bentonite chips, and hydrated until the chips come within 2-feet of the surface. These bore holes typically are installed as investigative type borings such as soil gas probes, geoprobe or CPT bore holes, etc. Note: this method is not always acceptable with local regulatory agencies, so check before implementing.

Bentonite chips will be installed by tremie pipe (depths greater than 10 feet) or free fall down the center of the drill pipe or auger to prevent bridging and voids. The chips will be hydrated at 5-foot intervals to allow for adequate saturation and expansion of the bentonite. The upper 6-inches of the boring will be completed with similar surface material (i.e., asphalt, concrete) as that removed to complete the boring. In the case of soil borings completed in an area absent of surface material, the overlying soil will be used to backfill the remaining 6-inches of the boring until flush with the surrounding surface.

5.4 Large Diameter, Deeper Soil Boring Abandonment

Larger diameter soil borings or those completed to a depth greater than 20 feet will be backfilled with bentonite-cement to within 2-feet of the surface. The bentonite-cement grout mixture will consist of a 94-pound sack of Portland cement to 7 gallons of potable water with 2 to 3 percent bentonite by dry weight. The Portland cement will meet ASTM C150 "Standard Specification for Portland Cement." The grout will be installed into borehole using a tremie pipe or equivalent to prevent bridging and dilution of sealing materials. The borehole will be backfilled preceding upward from the bottom of the boring in a continuous manner. The upper 2-feet of the boring will be completed with a concrete seal.

5.5 Well Destruction

Monitoring well destruction can occur with a wide variety of methods depending upon the hydrogeologic setting. Clear understanding of how the well is completed and what units the well is screened within is crucial for preparing a proper well destruction. A variety of materials may be allowed for well filling and sealing. The procedures below outline the most conservative approach: completely sealing the entire length of the well. This conservative approach is justified in that many of the wells involved with environmental services work monitor contaminants. Regulations may allow some flexibility with this approach, so check state or local requirements for more detail.

The general approach to well destruction presented below is to seal the well length with some material that will prevent migration between permeable layers in the subsurface and prevent surface material from short circuiting to depth in the subsurface. Two approaches are discussed below: well casing perforation and pressure grouting and overdrilling and grouting.

Pressure Grouting. Groundwater wells can be abandoned in place using pressure grouting methods. Prior to grouting well casing intervals adjacent to gravel pack and any void space should be perforated. The cement grout is then injected under pressure with the pressure maintained until the grout has set. The grout will consist of neat cement mixed at a ratio of one 94-pound sack of Portland cement to 5 to 6 gallons of potable water. The Portland cement will meet ASTM C150 "Standard Specification for Portland Cement." The monitoring well will be filled proceeding upward from the bottom of the well screens in a continuous manner. The volume of neat cement will be measured against the anticipated volume of the well (including borehole area) to verify adequate filling. The well casing will be cut at grade and capped with cement.

Overdrilling. Monitoring wells can be over-drilled using an approved drilling method (e.g., air-rotary, hollow-stem auger, others). All well material within the original borehole, including the probe points, teflon tubing, filter pack, and sealing material will be removed. The open borehole will then be backfilled by using tremie pipe to inject a neat grout cement into the subsurface as described above under pressure grouting. The grout cement should be allowed to settle and set, and any settling should be filled in with a concrete surface completion and monument.

5.6 Documentation And Records

Borehole monitoring well abandonment will be documented in the field logbooks. The following information will be recorded for each well decommissioned:

- Drilling contractor(s)
- Name of field person(s)
- Well number, depth and location, and static water-level or boring number, depth, and location
- Drilling equipment and method employed
- Date and time of abandonment

- Type and volume of sealant material (volume should be consistent with anticipated borehole volume)

6.0 QUALITY ASSURANCE/QUALITY CONTROL

Quality assurance/quality control is maintained during bore hole or monitoring well destruction through two primary actions. The first is to calculate the amount of cement grout that will be needed to fill the bore hole, should it be completed without collapse. These calculations should be completed in the field after it is known the bore hole dimensions. These calculations should be completed for both bore hole and well destruction operations.

The second quality control action that can be completed is to understand and know completely the well construction of the well being destroyed. Such knowledge is then put to use by verifying that the amount of casing pulled corresponds to that shown in well construction diagrams, or depths of removal or over drilling have been reached that correspond to original well depths.

7.0 REFERENCES

California Department of Water Resources, 1981, State of California Water Well Standards, Bulletin 74-81.

California Department of Water Resources, 1990, State of California Water Well Standards (modified), Bulletin 74-90.